

**METHODS OF FORMING TRENCH ISOLATED INTEGRATED CIRCUIT  
DEVICES INCLUDING GROOVES, AND TRENCH ISOLATED  
INTEGRATED CIRCUIT DEVICES SO FORMED**

**Abstract of the Disclosure**

Trench isolated integrated circuit devices are fabricated by forming a trench including sidewalls in an integrated circuit substrate, and forming a lower device isolation layer in the trench and extending onto the trench sidewalls. The lower device isolation layer includes grooves therein, a respective one of which extends along a respective one of the sidewalls. An upper device isolation layer is formed on the lower device isolation layer and in the grooves. Trench isolated integrated circuit devices include an integrated circuit substrate including a trench having sidewalls and a lower device isolation layer in the trench and extending onto the trench sidewalls.

5 The lower device isolation layer includes grooves therein, a respective one of which extends along a respective one of the sidewalls. An upper device isolation layer is provided on the lower device isolation layer and in the grooves.

10 The lower device isolation layer includes grooves therein, a respective one of which extends along a respective one of the sidewalls. An upper device isolation layer is provided on the lower device isolation layer and in the grooves.